ND Assembly
Mechanical Systems
WBS 2.8.2

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FNAL Director's Review

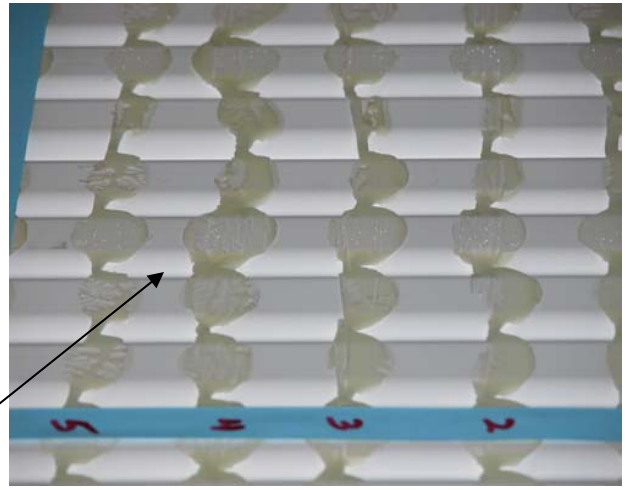
ND Mechanical Systems

- This is the equipment needed to construct and transport the IPND and ND.
- 4 and 8 plane IPND mechanical prototype has been constructed
- IPND/ND blocks will be constructed at ANL and shipped to FNAL.
- The main equipment are:
  - Assembly table
  - Lifting structure
  - Vacuum lifting fixture
  - Glue machine.

IPND Mechanical Prototypes

- **Two Prototypes have been constructed – a 4 plane and 8 plane prototype**
- 6 extrusions for horizontal layer and 4 extrusions for vertical layer
- Purpose:
  - Gain a feel for assembling large extrusions
  - Understand forces needed to move glued modules.
  - Understand forces needed to take out banana.
  - Take ES&H measurements during gluing of large area.
  - Understand what is needed for compression of modules.
  - Record Extrusion Thicknesses

Testing
IPND Mechanical Prototype

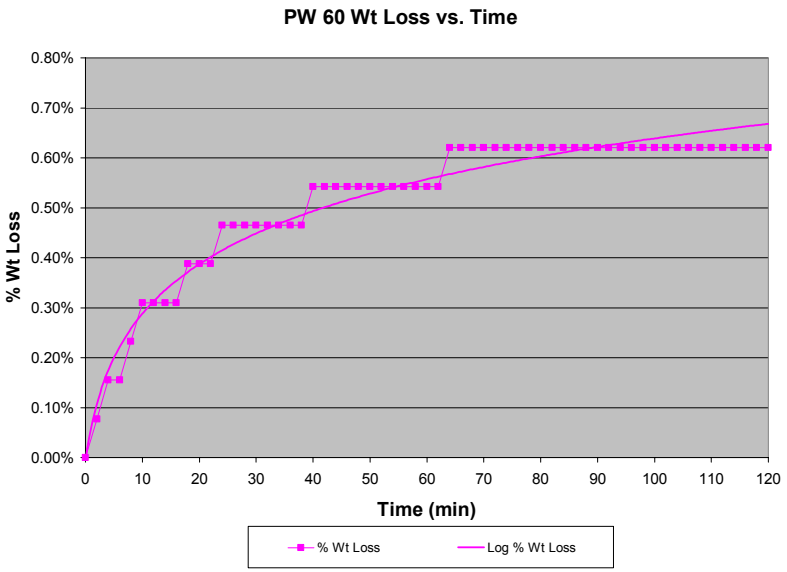


Rotated assembly to 45 degrees – maximum deflection is ~1mm. Assembly is now simply supported and deflection over time will be measured.

Compressed Glue Lines

Methyl Methacrylate Measurements

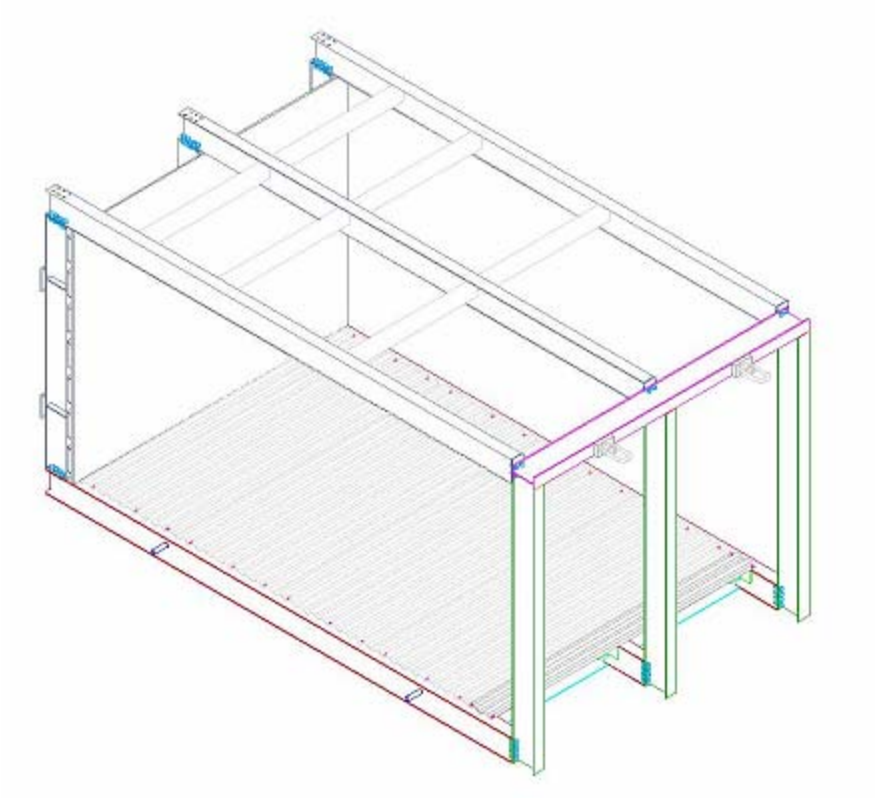
- Devcon 60 is the structural adhesive – MMA released during curing.
- Extensive measurements have been conducted on MMA generation.
- MMA concentrations during prototype construction are below acceptable concentrations.
- Evaluation is continuing on how to keep MMA concentrations within acceptable limits during construction.



SAMPLE NO.	DATE	NAME/ BADGE NO.	LOCATION/ OPERATION	METHYL METHACRYLATE CONC. (PPM[1])
39751	4/23/2007	Area Air Sample	E of panels on floor (4 ft. above floor)	0.8
39752	4/23/2007	Area Air Sample	E end below glue table (12 in. above floor)	0.5
39753	4/23/2007	K. Kephart/ 03119N	Adhesive Application	1.5
39754	4/23/2007	M. Slabaugh/ 14132N	Adhesive Application	4.3
39755	4/23/2007	Area Air Sample	E end of glue table, 5 ft. above floor (16 ft. E of exhaust fan)	0.9
39756	4/23/2007	Area Air Sample	Fan exhaust, 3.5 ft above floor (2.5 ft. W of fan)	0.3
39757	4/23/2007	Area Air Sample	Fan inlet (4 in. from filter)	0.7
39758	4/23 & 24/2007	Area Air Sample (Overnight)	After Panel Assembly, N side on floor (4 in. from panels on floor, 3 in. above floor)	1.5
39759	4/23 & 24/2007	Area Air Sample (Overnight)	After panel Assembly, on top of panels (9 in. above panel)	0.6

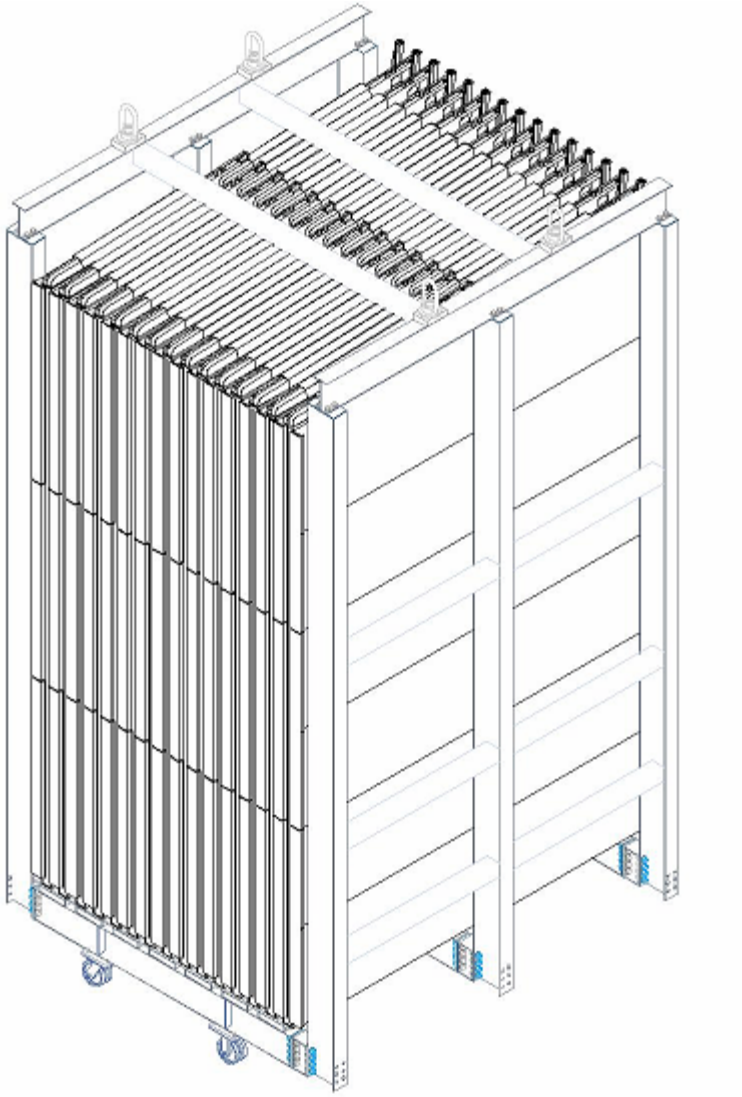
Assembly Table

- Blocks will be constructed in assembly table/frame.
- Assembly table/frame will be used to transport block to FNAL and then rotate to the vertical position

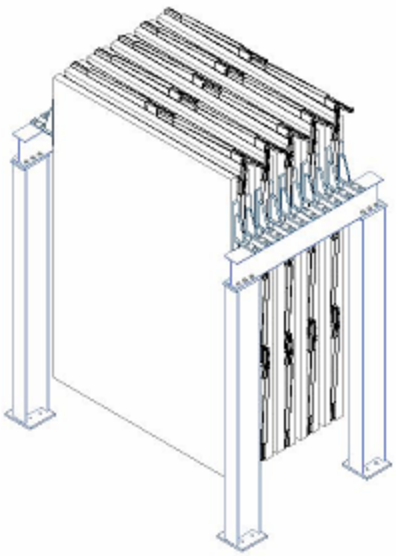


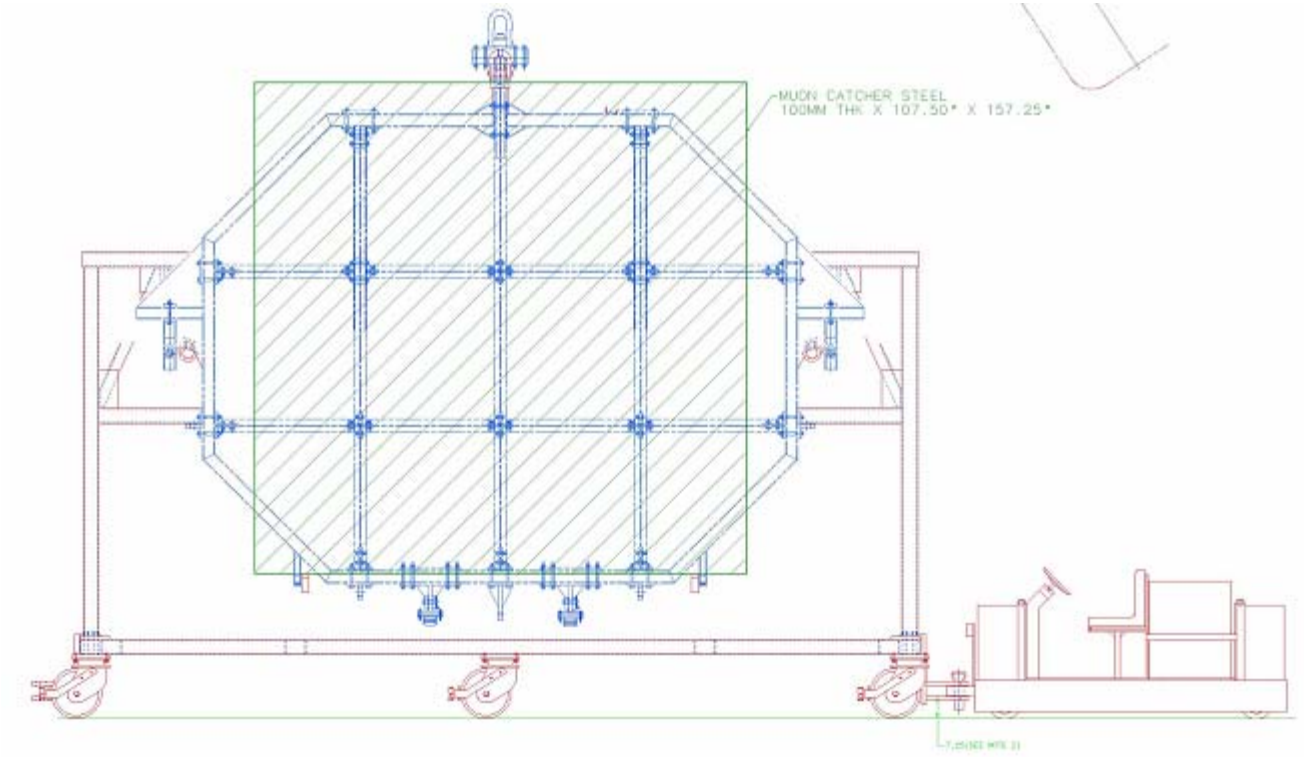
Block Lifting Frame

- Block lifting frame is used to lift and move block with a crane.
- Swivel wheels are added for moving empty blocks to final position.
- Framework removed when blocks are brought into contact.



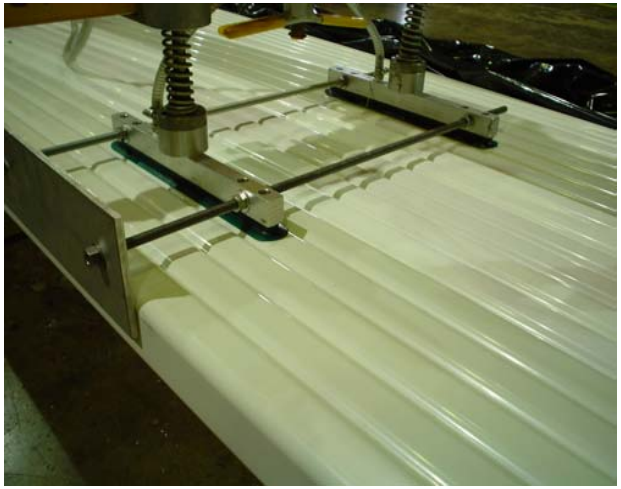
Muon Steel



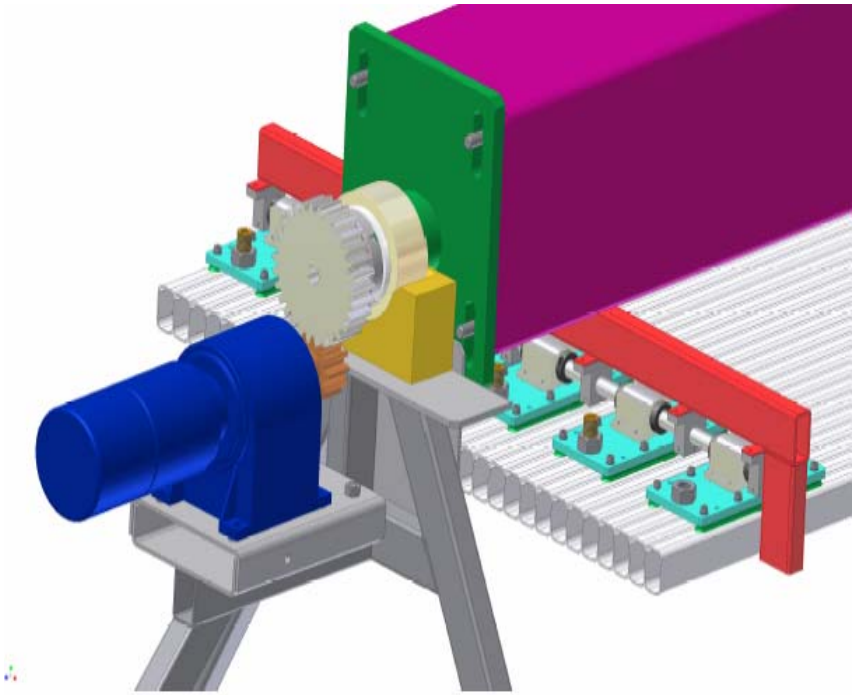


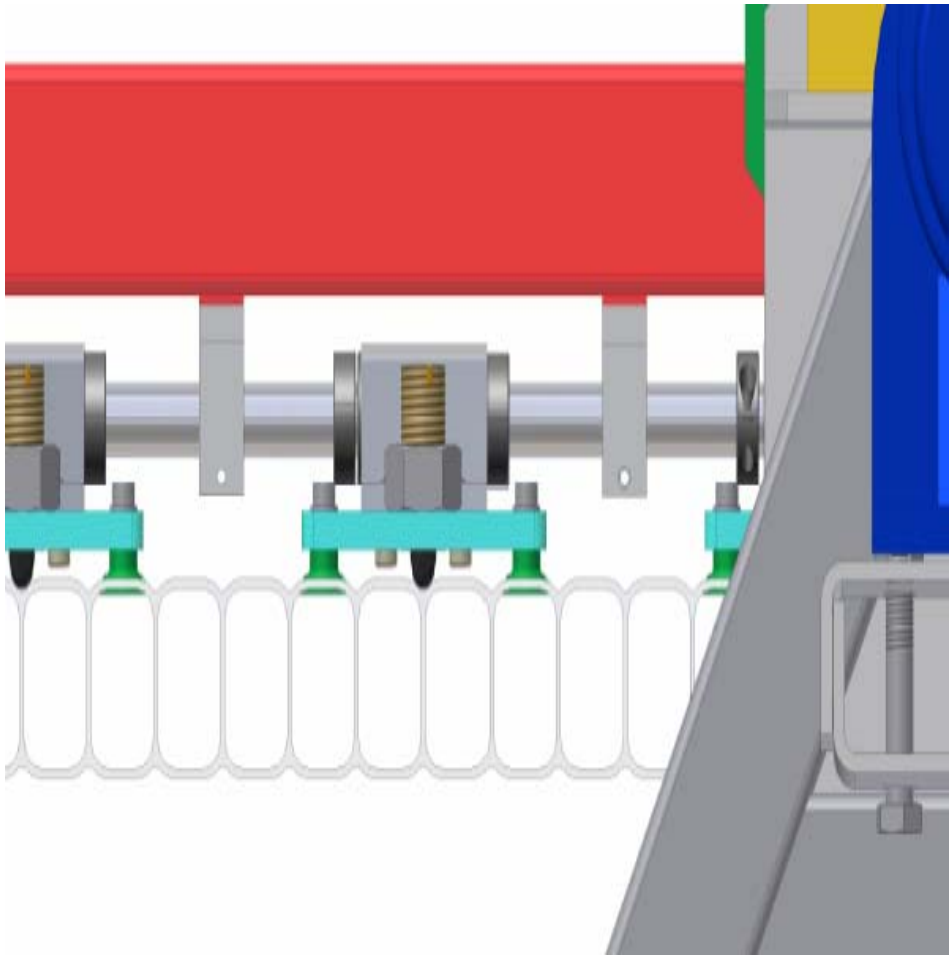
Lifting Fixture

- Lifting fixture is used to move modules and extrusions at the module factory and during the FD assembly.
- Fixture uses rectangular suction cups aligned by fixtures with the module scallops.
- Constructed and tested a prototype for lifting full width IPND modules and full length FD modules



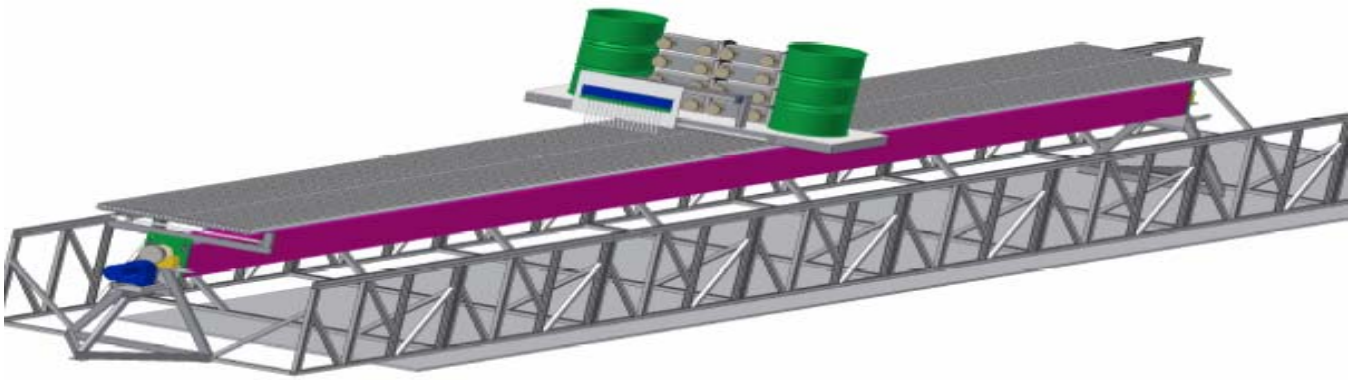
Lifting Fixture





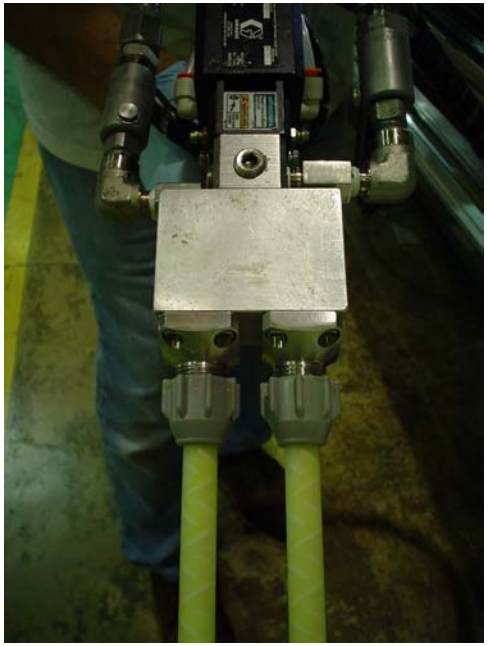
Adhesive Dispenser

- Gear motor driven adhesive dispenser mounted on moving carriage.
- 16 ribbons of adhesive applied in one pass along the length of a module.
- Prototype machine being constructed.
- Testing of adhesive application and spread are being conducted.



Adhesive Dispenser

- On-going tests of methods for applying adhesive to obtain good coverage and optimum glue line thickness.



Conclusion

- Prototype glue machine and lifting fixtures have been constructed.
- Final design of IPND/ND equipment has been completed and ready for procurement.